outer circumferential face of the housing; a stator bonded to an upper end portion of an inner circumferential face of the circular hole of the base plate; a thrust pad vertically provided at the fixed shaft and mounted on the jaw portion of the fixed shaft, and further comprising:

B8 Con'd Sub C' cmd'd.

a cylindrical hub with both ends open, the cylindrical hub having an outer protruding portion protruding from an upper side of an outer circumferential face of the hub and an inner protruding portion protruding from a lower side of an inner circumferential face of the hub, the cylindrical hub spaced by a certain interval from the thrust pad;

a permanent magnet bonded to a lower side of an outer circumferential face of the outer protruding portion of the hub;

a disk mounted on the outer protruding portion of the hub; and

a clamp fixed to the hub by a bolt to mount the disk.

REMARKS

Claims 1 and 2 remain in this application. Claims 1 and 2 have been amended.

Reconsideration and allowance in view of the foregoing amendments and following remarks are respectfully requested.

The specification has been amended to describe the present invention more clearly. No new matter has been introduced by this amendment.

In the Office Action of November 2, 2001, claim 1 is rejected under 35 U.S.C. § 103(a) as being unpatentable over TAKEMURA et al., U.S. Patent No. 5,880,545

(hereinafter TAKEMURA) in view of SAKURAGI et al., U.S. Patent No. 5,598,047 (hereinafter SAKURAGI). This rejection is respectfully traversed.

Claim 1 has been amended to define a structural feature of the invention and to more clearly distinguish over the applied prior art references. In particular, a fixed shaft, a cylindrical hub, a disk and a clamp are defined more clearly. No new matter is added.

It is an object of the present invention to provide an ultra-slim structure of disk-spindle motor by removing an upper end portion of the hub of the spindle motor.

To achieve the above-noted object, the spindle motor of the present invention, as recited in amended claim 1, includes, inter alia, a base plate having a circular hole at a central portion thereof, a housing fixedly inserted into the circular hole of the base plate, a fixed shaft formed unitarily with the housing at an upper central portion of the housing, a stator bonded to an upper end portion of an inner circumferential face of the circular hole, a lower ball bearing bonded to a lower side of an outer circumferential face of the fixed shaft, an upper ball bearing spaced by a certain interval from the lower ball bearing and bonded to an upper side of the outer circumferential face of the fixed shaft.

The spindle motor further comprises a cylindrical hub both ends of which are open, the cylindrical hub having an inner protruding portion protruding from a central portion of an inner circumferential face of the hub and an outer protruding portion protruding from an upper side of the outer circumferential face of the hub, the inner protruding portion being

fixedly provided between the lower ball bearing and the upper ball bearing. A permanent magnet is bonded to a lower side of an outer circumferential face of the outer protruding portion of the hub, a disk is mounted on an upper face of the outer protruding portion of the hub, and a clamp is fixed to the upper side of the hub by a bolt to mount the disk.

The references cited to support the rejection do not disclose such a combination of features. The primary reference TAKEMURA refers to and is concerned specifically with a spindle motor having a bearing system for fluid sealing and leakage prevention. In TAKEMURA, a ferro-fluid sealing device 216 is provided adjacent to the lower portion of the lower ball bearing 251. A cap 215 is secured to the shaft 205 from the top of the upper ball bearing 208 so as to be adjacent thereto. The outer peripheral section of the cap 215 is bent downwardly or toward the interior of the motor to form a peripheral wall 215c. The peripheral wall 215c and the outer peripheral section of a cylindrical sleeve 209 from a small gap 224 in the radial direction, thereby forming a labyrinth sealing structure. The labyrinth sealing structure and the ferro-fluid sealing device 216 together substantially seal the motor.

The Examiner stated in the Office Action that TAKEMURA illustrates a spindle motor in Figure 14, which consists of a fixed shaft 205 mounted in a circular hole within the central portion of the base 201, a cylindrical hub with an outer protruding portion at the upper inner surface of the hub and an inner protruding portion of the hub between the upper and lower ball bearings 208 and 251, a permanent magnet 211 which is attached to the lower

outer face of the outer protruding portion of the hub, a stator 203 that is attached to the upper end portion of the inner circumferential face of the base, and a disk 214 which is mounted to the outer protruding portion of the hub.

However, the configuration of TAKEMURA does not disclose the above described features of the present invention. In Figure 14 of TAKEMURA, the housing is not even shown while in the present invention the housing 210 is recited as fixedly inserted into the circular hole of the base plate. In Figure 14 of TAKEMURA, the lower portion of the shaft 205 is secured to a base member 201 of the drive by a nut and the upper portion of the shaft is screwed to the driving device by means of a cover member while in the present invention the fixed shaft 220 is recited as formed unitarily with the housing at an upper central portion of the housing 210. In Figure 14 of TAKEMURA, the cylindrical sleeve 209 is mounted to the inner periphery of the rotor hub 210 for mounting a disk while in the present invention the cylindrical hub 250 is recited as having an inner protruding portion 251 formed along a central portion of an inner circumferential face of the hub and an outer protruding portion 252 protruding from an upper side of the outer circumferential face of the hub. In Figure 14 of TAKEMURA, the cover member 250 is simply screwed to the upper portion of the shaft without any connection to a disk while in the present invention the clamp 280 is recited to be fixed with the hub using a bolt in order to mount the disk 270.

Furthermore, in the present invention, without additional components such as the sealing device 216 and the cap 215 of TAKEMURA, only the clamp 280 is used to provide a sealing structure, thereby forming an ultra-slim disk spindle motor.

The present invention provides an advantage in that the spindle motor can be mounted on a small size personal digital assistant (PDA), a digital camera, and so on because the upper end portion of the hub of the spindle motor is removed in the ultra-slim spindle motor of the present invention (see page 7, lines 3-7). These features are also not shown by TAKEMURA.

The secondary reference SAKURAGI is directed to a structure of the brushless motor of the outer rotor-type that fixes a rotor magnet on an inner circumference of a cylindrical recess formed in a hub having a magnetic disk.

The Examiner stated in the Office Action that SAKURAGI shows, in Figure 15, a permanent magnet that is attached to the hub by a lower inner protruding portion of the hub, and SAKURAGI illustrates in Figure 15, a spindle motor with a clamp 37 attached to the hub 2 with bolts 39 to mount a disk 36.

However, in Figure 15 of SAKURAGI, the hub 2 does not have either the inner protruding portion or the outer protruding portion. Instead, the spacer 12 and the disk spacer 38 are utilized. In Figure 15 of SAKURAGI, the stationary shaft 1 is secured to the inner bearing seats while in the present invention the fixed shaft 220 is formed integrally with the

housing at an upper central portion of the housing 210. Furthermore, in Figure 15 of SAKURAGI, the rotor magnet 4 is fixed on the inner circumference of the cylindrical recess while in the present invention the permanent magnet 260 is bonded to a lower side of an outer circumferential face of the outer protruding portion of the hub.

Therefore, SAKURAGI doesn't overcome the deficiencies of TAKEMURA. Thus, the asserted combination of TAKEMURA and SAKURAGI would not result in the invention as recited in amended claim 1.

In the Office Action, claim 2 is rejected under 35 U.S.C. § 103(a) as being unpatentable over TAKEMURA, SAKURAGI and LEE et al., U.S. Patent No. 6,071,014 (hereinafter LEE). This rejection is also respectfully traversed.

Claim 2 has been amended to define the structural feature of the invention and to more clearly distinguish over the applied prior art references. In particular, a cylindrical fixed shaft and an inner protruding portion are defined more clearly. No new matter is added.

The spindle motor recited in amended claim 2 includes a base plate having a circular hole at a central portion of the base plate, a housing fixedly inserted into the circular hole of the base plate, a fixed cylindrical shaft formed unitarily with the housing at an upper central portion of the housing and having a jaw portion at a central portion of an outer circumferential face of the housing, a stator bonded to an upper end portion of an inner

circumferential face of the circular hole of the base plate, and a thrust pad vertically inserted at the fixed shaft and mounted on the jaw portion of the fixed shaft.

The spindle motor further comprises a cylindrical hub with both ends open, the cylindrical hub having an outer protruding portion protruding from an upper side of an outer circumferential face of the hub and an inner protruding portion protruding from a lower side of an inner circumferential face of the hub, the cylindrical hub spaced by a certain interval from the thrust pad, a permanent magnet bonded to a lower side of an outer circumferential face of the outer protruding portion of the hub, a disk mounted on the outer protruding portion of the hub, and a clamp fixed to the hub by a bolt to mount the disk.

TAKEMURA and SAKURAGI references cited to support the rejection do not disclose such a combination of features as described above with respect to claim 1. The third reference Lee refers to and is concerned specifically with a disk drive bearing system that has a long life even when used at a high rotational speed, eliminates oil leaks, and reduces wear and friction resulting in power savings.

Although the spindle of LEE includes a thrust pad, there are significant conspicuous differences between LEE and the present invention recited in claim 2. In the present invention, the cylindrical fixed shaft 320 is formed unitarily with the housing at an upper central portion of the housing 310. On the other hand, in LEE, the lower portion of the fixed

shaft 122b is secured to the base plate 124b by a bolt, and the upper portion of the fixed shaft 122b is secured to the driving device by means of a cover member 250 by a bolt.

Also, in the present invention, the stator 330 is bonded to an upper end portion of an inner circumferential face of the circular hole of the base plate 300, while, in LEE, the annular stator 176b is connected to the base member. Furthermore, in LEE, the spindle motor 120b includes a containment plate 154b to block the fluid, while, in the present invention, the clamp 280 serves as the containment plate 154b, thereby forming an ultra-slim disk spindle motor.

Therefore, LEE doesn't overcome the deficiencies of TAKEMURA and SAKURAGI. Thus, the asserted combination of TAKEMURA, SAKURAGI and LEE would not result in the invention as recited in amended claim 2.

The drawings have been objected because Figure 1 is not designated by a legend such as --Prior Art--, Figures 2a and 2b are missing a reference line for the permanent magnet which is identified as 260, and reference characters "251'" and "252" have both been used to designate the inner protruding portion of the hub, claim 1, lines 15 and 19.

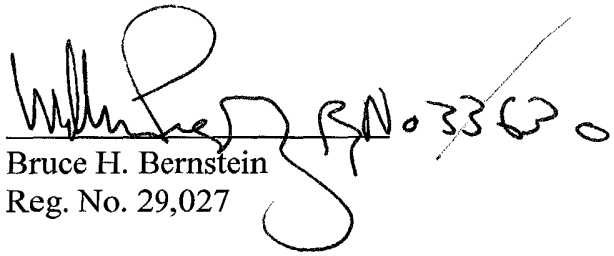
In response, the drawings have been amended to provide a legend --Prior Art-- in Figure 1, and place the reference lines in Figures 2a and 2b. However, all the numerals in the claim have been removed by the Preliminary Amendment submitted on October 5, 2001.

Claims 1 and 2 are now in condition for allowance in view of the above-noted remarks. It is respectfully requested, therefore, that the rejections of claims 1 and 2 under 35 U.S.C. § 103(a) be withdrawn.

Based on the above, it is respectfully submitted that this application is now in condition for allowance, and a Notice of Allowance is respectfully requested.

Should the Examiner have any questions or comments regarding this response, or the present application, the Examiner is invited to contact the undersigned at the below-listed telephone number.

Respectfully submitted,
Gunhee JANG et al.



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P20978.A04

MARKED-UP COPY OF THE SPECIFICATION

Please amend the paragraph on page 2, beginning at line 15, as follows:

---The hub 60 is in a hollow cylindrical shape and has a protruding portion at an upper portion of an outer circumferential portion. The hub 60 is formed [integrally] unitarily with the shaft 50 and it is spaced apart by a certain interval from the inner portion of the housing 20.---

Please amend the paragraph on page 2, beginning at line 24, as follows:

---The clamp 90 is mounted on the upper side of the hub 60 formed [integrally] unitarily with the shaft 50 and is fixed to the shaft 50 using a bolt in order to mount the disk 80.---

Please amend the paragraph on page 3, beginning at line 10, as follows:

---To achieve the above object, there is provided an ultra-slim disk-spindle motor comprising[:] a base plate [200] having a circular hole formed at an inner lower portion of a central part thereof[;] and a housing [210] fixedly inserted into the circular hole of the base plate[; a]. A fixed shaft [220] is formed [integrally] unitarily with the housing at an upper central portion of the housing [210;], a stator [230] is bonded to an upper end portion of an inner circumferential face of the circular hole[;], a lower ball bearing [241] is bonded to a

lower side of an outer circumferential face of the fixed shaft [220;], an upper ball bearing [242] is spaced apart by a certain interval from the lower ball bearing [241] and is bonded to an upper side of the outer circumferential face of the fixed shaft [220;] and a cylindrical hub [250] of which both ends are [opened, the] open. The cylindrical hub [250 having] has an inner protruding portion [251 formed along] protruding from a central portion of an inner circumferential face of the hub and an outer protruding portion [252 formed along] protruding from an upper side of the outer circumferential face of the hub, the inner protruding portion [251] being fixedly inserted between the lower ball bearing [241] and the upper ball bearing [242; a]. A permanent magnet [260] is bonded to a lower side of an outer circumferential face of the outer protruding portion [252] of the hub [250;], a disk [270] is mounted on an upper face of the outer protruding portion [252] of the hub [250;] and a clamp [280] is fixedly [firmly] attached on the upper side of the hub using [a bolt 281 and 282] bolts in order to mount the disk [270].---

Please amend the paragraph on page 4, beginning at line 25, as follows:

---The housing 210 is formed [integrally] unitarily with the fixed shaft 220 and is vertically inserted at the circular hole of the base plate 200 and is fixed. Alternatively, the housing 210 is formed [integrally] unitarily with the base plate 200.---

Please amend the paragraph on page 5, beginning at line 19, as follows:

---The clamp 280 is fixed on the upper side of the hub 250 using a bolt 281 and 282 in order to mount the disk 270.---

Please amend the paragraph bridging pages 5 and 6, beginning on page 5 at line 30, as follows:

---The housing 310 is formed [integrally] unitarily with the fixed shaft 320 having a jaw portion at a central portion of an outer circumferential face thereof. The housing 310 is vertically inserted at the circular hole of the base plate 300 and is fixed. Alternatively, the housing 310 is formed [integrally] unitarily with the base plate 300.---

Please amend the paragraph on page 6, beginning at line 20, as follows:

---The clamp 380 is fixed with the upper side of the hub 350 using a bolt 381 and 382 in order to mount the disk 370.---

MARKED-UP COPY OF THE CLAIMS

1. (Twice Amended) A disk-spindle motor having: a base plate having a circular hole at a central portion thereof; a housing fixedly inserted into the circular hole of the base plate; a fixed shaft formed [integrally] unitarily with the housing at an upper central portion of the housing; a stator bonded to an upper end portion of an inner circumferential face of the circular hole; a lower ball bearing bonded to a lower side of an outer circumferential face of the fixed shaft, an upper ball bearing spaced by a certain interval from the lower ball bearing and bonded to an upper side of the outer circumferential face of the fixed shaft, and further comprising:

a cylindrical hub [of which] with both ends [are opened] open, the cylindrical hub having an inner protruding portion [formed along] protruding from a central portion of an inner circumferential face of the hub and an outer protruding portion [formed along] protruding from an upper side of the outer circumferential face of the hub, the inner protruding portion being fixedly [inserted] provided between the lower ball bearing and the upper ball bearing;

a permanent magnet bonded to a lower side of an outer circumferential face of the outer protruding portion of the hub;

a disk mounted on an upper face of the [inner] outer protruding portion of the hub; and

a clamp fixed to the upper side of the hub [using] by a bolt [in order] to mount the disk.

2. (Twice Amended) A disk-spindle motor having: a base plate having a circular hole at a central portion of the base plate; a housing fixedly inserted into the circular hole of the base plate; a fixed cylindrical [fixed] shaft formed [integrally] unitarily with the housing at an upper central portion of the housing and having a jaw portion at a central portion of an outer circumferential face of the housing; a stator bonded to an upper end portion of an inner circumferential face of the circular hole of the base plate; a thrust pad vertically [inserted] provided at the fixed shaft and mounted on the jaw portion of the fixed shaft, and further comprising:

a cylindrical hub [of which] with both ends [are opened] open, the cylindrical hub having an outer protruding portion protruding from an upper side of an outer circumferential face of the hub and an inner protruding portion protruding [along] from a lower side of an inner circumferential face of the hub, the cylindrical hub spaced by a certain interval from the thrust pad;

a permanent magnet bonded to a lower side of an outer circumferential face of the outer protruding portion of the hub;

a disk mounted on the outer protruding portion of the hub; and

a clamp fixed to the hub [using] by a bolt [in order] to mount the disk.